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Original Research

Structural and Construct Validity of the Foot and Ankle Ability Measure (FAAM) With an Emphasis on Pain and Functionality After Foot Surgery: A Multicenter Study

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A B S T R A C T

The Foot and Ankle Ability Measure (FAAM) is a patient-reported outcome measure that is available in several languages. We aim to assess the structural and construct validity of the FAAM with an emphasis on pain and functionality after foot surgery. The activities of daily living (ADL) and Sports subscales of the Finnish version of the FAAM were completed by 182 patients who underwent operative treatment for disorders of the foot. Convergent validity was assessed by principal component analysis using Spearman's correlation coefficient between the FAAM subscales and the principal components (Function-PC and Pain-PC) derived from validated patient-reported outcome measures. Subscales were studied for floor and ceiling effects, internal consistency and unidimensionality. Internal consistency was examined with Cronbach's alpha and the subscale structure with exploratory factor analysis. FAAM-ADL had high correlation with the Function-PC (r = 0.87, 95% confidence interval [CI] 0.81-0.91) and the Pain-PC (r = 0.75, 95% CI 0.65-0.83). FAAM-Sports had moderate correlation (r = 0.64, 95% CI 0.50-0.74) with the Function-PC and high correlation (r = 0.74, 95% CI 0.64-0.82) with the Pain-PC. No floor or ceiling effects were observed. Cronbach's alpha was 0.97 (95% CI 0.96-0.98) for the ADL and 0.93 (95% CI 0.91-0.95) for the Sports subscales. The results supported the unidimensionality of the FAAM-Sports. Within the ADL subscale, 3 factors were identified, suggesting a 3-factor model for the FAAM overall. Results highlighted the inter-relationship of pain and physical function. Further research on longitudinal validity is needed.

The evaluation of patients with musculoskeletal disorders cannot solely rely on solely on clinical examination, impairment-orientated data, or radiological imaging. Indeed, validated and reliable outcome measures are fundamental for the evaluation and comparison of the effects of functional restrictions and rehabilitation. The Foot and Ankle Ability Measure (FAAM) is an instrument used to evaluate the physical function and activities of daily living (ADL) from a patient-reported perspective in individuals with foot and ankle impairments. Originally developed in 2005 by Martin et al, the FAAM has been validated for foot and ankle assessment and is widely used by orthopedic surgeons (1-4). The FAAM is a 29-item questionnaire consisting of 21-item ADL and 8-item sport subscales (Sports). Translations and cross-cultural validations of the FAAM are available for several languages, such as Dutch, Turkish, French, Japan, Chinese, Persian, and Spanish (5-11). The Finnish version of the FAAM has also been established and validated (12).

Patient-reported outcome measures (PROMs) should be chosen according to their measurement properties, which include reliability, validity, and repeatability (13). Previous studies have shown FAAM to be a reliable instrument for the evaluation of several foot and ankle pathologies, with both good content and construct validity and responsiveness (2,4,14). Additional evidence in support of the construct validity of the FAAM has been provided for chronic ankle instability (5,6). Furthermore, systematic reviews by Eechaute et al and Martin et al have described the evaluative aspects and the usefulness of the FAAM in the quantifying of functional limitations in patients with a variety of leg, foot and ankle pathologies (15,16). A recent study found a

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correlation between self-reported depression and higher dysfunction measured with the FAAM (17). Moreover, structural validity with unidimensionality on both subscales of the FAAM has been confirmed with Rasch Measurement Theory analysis in traumatic foot and ankle patients (18).

There is significant variance in the measurement properties between different PROMs. Furthermore, it is important that the areas of disability experienced by patients after foot and ankle surgery are fully understood. Therefore, more research is needed to reveal the psychometrical properties of the existing instruments. Pain-related disability can be a central feature of the patient-experience of operated foot patients. However, there is a scarcity of studies that have directly investigated the correlation between physical function and pain interference and the FAAM.

Our primary aim was to determine whether physical function and pain correlate with the FAAM in surgically treated patients with chronic foot pathology. Our secondary aim was to assess the structural and construct validity of the FAAM by studying the psychometrical properties of the FAAM subscales. We undertook a principal component analysis to analyze the convergent validity for the pain and functionality aspects, using the pain and functionality subscales from previously validated PROMs as a reference tool. To analyze the unidimensionality, an exploratory factor analysis (EFA) was used to analyze the subscale structure.

Patients and Methods

This was a multicenter study conducted between January 2018 and November 2018. Potential participants consisted of patients who were receiving surgical treatment for a chronic foot disorder. The patients for this study were recruited from 2 large academic centers: Oulu University Hospital (Oulu, Finland) and Peijas Helsinki University Hospital (Vantaa, Finland). The inclusion criteria of the study were at least 18 years of age, a chronic foot pathology diagnosed by a physician, a full understanding of the written language, and the signing of an informed consent from adhering to the principals of the Declaration of Helsinki (19). Exclusion criteria were aged less than 18 years, severe untreated mental illness and not understanding the Finnish language. The study protocol was approved by the Ethics Committee of Helsinki and Uusimaa Hospital District and study permission was obtained from the recruiting hospitals.

Patients completed a preoperative information form containing clinical and sociodemographic questions as well as an item regarding the current state of their general health. Patients completed either a paper version of the Finnish version of the FAAM or an electric version on a tablet computer (iPad, Apple) simultaneously with selected Visual Analogue Scale Foot Ankle (VAS-FA), Foot and Ankle Outcome Score (FAOS), Manchester-Oxford Foot Questionnaire (MOxFQ), Lower Extermity Function Scale (LEFS) and European Foot and Ankle Society Score (EFAS) subscales concentrating on pain and functionality. Electronic data were collected 6 months after the surgery using the Webropol survey platform (Webropol Oy, Helsinki, Finland).

Patient-Reported Outcome Measures

FAAM

Each item of the FAAM is scored on a 5-point Likert scale with 4 points representing no difficulty at all; 3 points, slight difficulty; 2 points, moderate difficulty; 1 point, extreme difficulty; and 0 points, unable to do. The sixth option is not applicable (N/A) if patients feel that this item does not concern them. If all items are answered, the ADL and Sports subscales have a maximum score of 84 and 32, respectively. The obtained scores are transformed to percentages by dividing them with the maximum potential score and then multiplying the result by 100. Higher scores indicate a higher level of functional status in each of the 2 subscales (2). Previous research suggests that the electronic version of the Finnish version of the FAAM has satisfactory construct validity, coverage, and targeting of the scales in electively operated foot and ankle patients (14).

VAS-FA

The VAS-FA is a foot and ankle–specific PROM, in which 20 items have been divided into 3 modules: (1) Pain (4 items), (2) Function (11 items), and (3) Other complaints (5 items). For each question, a VAS-value ranging from 0 to 100 points is possible. Therefore, the total value for the entire score (all 20 questions answered) is therefore 0 to 2000 points, which is divided by 20, resulting in a possible total score ranging from 0 to 100 points. To assess the results from a single category, the total score from the category is divided by the number of questions. The VAS-FA questionnaire has been validated in several languages, including Finnish (20-23).

FAOS

FAOS, developed from the self-reported questionnaire KOOS (Knee Injury and Osteoarthritis Outcome Score) questionnaire, consists of 42 items divided into 5 subscales covering different dimensions: (1) Symptoms (7 items); (2) Pain (9 items); (3) ADL (17 items); and (4) Sport and Recreation Activities (5 items), and foot and ankle-related quality of life (QoL, 4 items). Each item is scored on a 5-point Likert scale from 0 to 4. Raw scores are standardized into a 0 to 100 scale, with higher scores indicating higher dysfunction. FAOS has been validated for a variety of foot and ankle disorders (24,25,42,43).

MOxFQ

Developed originally for the evaluation of the results after hallux valgus surgery, the MOxFQ has been validated for foot and ankle surgery (26-28). Furthermore, it has been proved to be a reliable and valid patient-reported instrument with acceptable responsiveness in patients with various foot and ankle conditions (29). The MOxFQ consists of 16 items, divided into 3 subscales: (1) Walking/standing (7 items), (2) Pain (5 items), and (3) Social interaction (4 items). Items are scored on a 5-point Likert scale from 0 to 4, with 4 denoting the most severe response. Raw scores are then converted to a 0 to 100 scale in which the maximum score indicates the highest dysfunction.

Modified LEFS

The modified LEFS consists of 15 items, evaluated on a 5-point scale with scores ranging from 0 (extreme difficulty/unable to perform activity) to 4 (no difficulty). The maximum score of 80 indicates no functional limitations and the minimum score of 0 indicates extreme limitations. The literature concerning the measurement properties of LEFS scores indicates that it is a reliable, valid, and responsive tool for assessing functional status in several populations with lower extremity musculoskeletal conditions (30). A recent study concerning LEFS showed suboptimal longitudinal validity in a generic sample of orthopedic foot and ankle patients (44).

EFAS Score

EFAS Score was developed, validated and published by the European Foot and Ankle Society (31). Covering pain and physical function, the EFAS Score has been validated in 7 European languages, including Finnish, and has been found to be internally consistent, unidimensional, and responsive to change in samples of orthopedic foot and ankle surgery patients (31,32). The EFAS Score contains 6 questions with a maximum score of 24 points indicating no limitations and a minimum score of 0 points indicating extreme limitations. In the original validation process, the development of the EFAS Sports Score was unsuccessful. According to the validation process in the Finnish language, a 4-item Sports score could, however, be considered. The EFAS Sports Score has a maximum score of 16 points indicating no limitations and minimum score of 0 points indicating extreme limitations.

Sample Size Calculation

To test the psychometrical properties, assuming the null hypothesis of a mean square error of approximation (RMSEA) from 0.04 to 0.085, with an alpha value of 0.05, a statistical power of 0.8 and a maximum of 26 degrees of freedom, as presented by MacCallum et al, a sample size of 180 patients was required for the analyses (33). This number was then over-estimated by approximately 10% to cover possible losses.

Statistical Analysis

Descriptive statistics including means and standard deviations were reported to assess and describe the ADL and Sport subscale outcome measures. Floor and ceiling effects for the subscales were confirmed if at least 15% of patients scored the minimum or maximum points (34). Further, the proportions of minimum and maximum score responses for each item were calculated. Cronbach's alphas of the FAAM as well as of the subscales were calculated to assess the internal consistency. A Cronbach's alpha value between 0.70 and 0.95 was considered ideal (35). Bootstrapped 95% confidence intervals (95% CIs) were estimated with 1000 repetitions.

The 2-subscale structure of the FAAM was examined using EFA. The number of factors included in further examination was determined by conducting a parallel analysis. In the EFA, the maximum likelihood method was used with varimax rotation. An item with a factor loading value over 0.4 was interpreted as sufficiently representing the given underlying factor. To assess the importance of each identified factor, the proportion of the variance explained as well as the sum of the squared loadings for each factor were calculated. In addition, eigenvalues of each factor were examined to measure how much of the variance of the observed variables a factor explains. The sum of the squared loadings' value and an eigenvalue of 1 was used as a cut-off value with higher values suggesting the retaining of the factor in the model. The total proportion of the variance explained was then calculated. Communalities of the items were examined to assess how strongly each item contributes with the factor model provided by the factor analysis.

To assess convergence of the FAAM subscales with the main concerns of patients undergoing foot surgery, we formed principal components (PCs) for pain and functionality using existing, validated PROM instruments. Two separate principal component analyses were conducted. All items of the Pain subscales of the VAS-FA, FAOS, and MOxFQ instruments were included in the first analysis, and all items of the LEFS, VAS-FA Function subscale, FAOS ADL subscale, and MOxFQ Walking subscale were included in the second analysis. In both principal component analyses, the first factor with the highest eigenvalue was selected for further examination. Spearman's correlation coefficients with 95% confidence intervals of the identified principal components of pain and functioning with the FAAM ADL and Sports total scores were calculated. Spearman's correlation coefficients were interpreted as follows: negligible (from 0.00 to 0.29), low (from 0.30 to 0.49), moderate (from 0.50 to 0.69), and high (from 0.70 to 1.00). Locally estimated scatterplot smoothing (LOESS) curves were drawn for the principal components against the FAAM subscales to assess the further investigation of the association between the FAAM scores with pain and function principal components.

Patients with more than 2 missing values for each of the FAAM subscales were excluded from the analysis. Statistical significance was defined at the 5% ($p \leq .05$) level. Statistical analyses were performed using R statistical software (version 3.1.6) (36). The R packages tidyverse, psych, RVAideMemoire, and ltm were used in the analyses (37-40).

Results

A total of 182 patients [47 male (25.8%) and 134 female (73.6%), $p <$ .001] with sufficient responses to the Finnish version of the FAAM and the reference instruments were included in our study. The demographic information, the score distributions of the instruments, and the proportions of disorders and surgical procedures are presented in Table 1. The mean age of the patients was 56.8 years (standard deviation [SD] 12.1, range 18-81 years). The most common diagnoses among the patient population were hallux valgus (19.1%), hallux rigidus (13.7%) and other toe deformities (13.2%). The most common surgical operations carried out were fusion of the first metatarsal joint (32.4%), osteotomy or rotation osteotomy of first metatarsal bone (13.7%) and other operations on bones of the foot (11.0%). More detailed information on the diagnoses and surgical operations are presented in Table 1.

The ADL score distribution (mean 74.4, SD ± 19.5) was not normal, but skewed towards the higher scores, while the Sports score distribution (mean 55.9, SD ± 27.0) was flat covering the entire scale (Fig. 1). Maximum scores in the ADL subscale were obtained from 8 (4.3%) patients, whereas no patients scored minimum points. In the Sports subscale, one patient (0.5%) scored minimum points and 10 (5.4%) patients scored maximum points. Thus, with the threshold of 15% of patients, no floor or ceiling effects were observed in either of the subscales. The mean scores of each of the PROM instruments are presented in Table 2.

In the ADL subscale, the proportion of minimum score responses was less than 15% in all items (Table 3). Conversely, the proportion of maximum score responses was more than 15% in all items, except 2. In the Sports subscale, 5 out of 8 items had the proportion of maximum score over 15% and 1 out of 8 had the proportion of minimum score over 15%. Cronbach's alpha of the FAAM instrument was 0.97 (95% CI from 0.96 to 0.98). Alphas of the ADL and Sports

Table 1
Sociodemographic characteristics of the participants (N = 182)

Age (years), Mean (SD)	56.8 (12.1)
Gender, n (%)	
Male	47 (25.8)
Female	134 (73.6)
BMI (kg/m^2), mean (SD)	27.3 (4.6)
Diagnosis, n (%)	
Hallux valgus	53 (19.1)
Hallux rigidus	25 (13.7)
Other toe deformity	24 (13.2)
Arthrosis	24 (13.2)
Metatarsalgia	9 (4.9)
Pes planus	9 (4.9)
Rheumatoid arthritis	6 (3.3)
Gout	5 (2.7)
Cyst or ganglion	5 (2.7)
Other	22 (12.1)
Operation, n (%)	
Fusion of first tarsometatarsal joint	59 (32.4)
Osteotomy or rotation osteotomy of first metatarsal bone	25 (13.7)
Other operation on bone of foot	20 (11.0)
Arthroplasty of tarsometatarsal or interphalangeal joint	15 (8.2)
Osteotomy or rotation osteotomy of II-V metatarsal bone	11 (6.0)
Other joint fusion of foot	11(6.0)
Operation on muscle, tendon, fascia, ganglion, synovial sheath or bursa of foot	10 (5.5)
Other fusion between bones of foot	9 (4.9)
Other	17 (9.3)

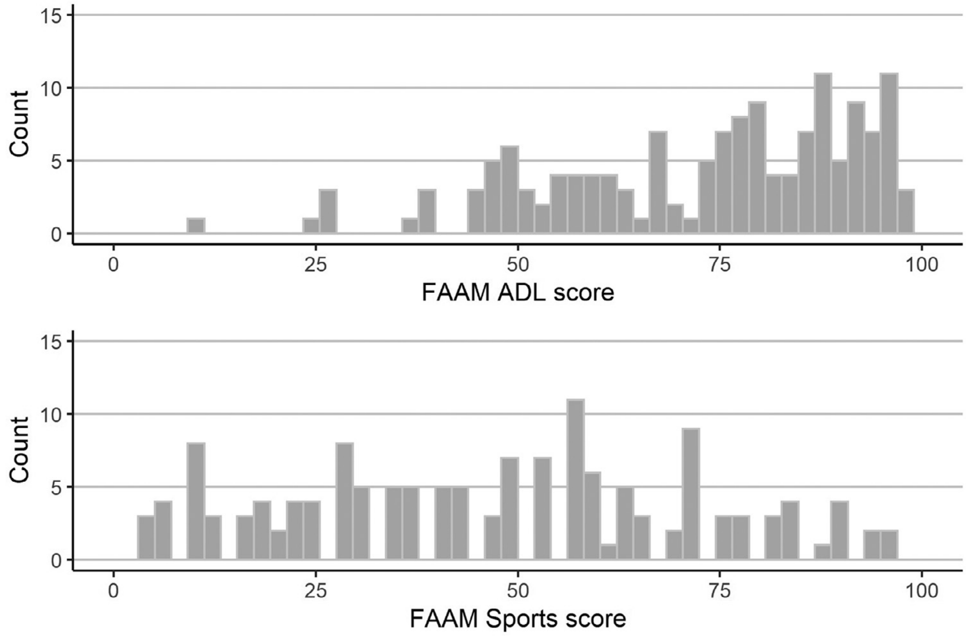

Fig. 1. Distribution of the FAAM activities of daily living (ADL) and sports subscale scores among the patient population.

subscales were 0.97 (95% CI from 0.96 to 0.98) and 0.93 (95% CI from 0.91 to 0.95), respectively.

The principal component formed of the function items (Function-PC) of the reference instruments had an eigenvalue of 24.1. The function principal component explained 48.3% of the variance of the function items of the reference PROMs. Formation of the principal component of the pain subscales (Pain-PC) of reference instruments resulted in a principal component that explained 52.0% of the variance of the pain items in the reference PROMs with an eigenvalue of 9.4. The results of the correlation analyses between the FAAM subscales and the pain and function principal components are presented in Fig. 2 with Spearman correlation coefficients. The correlation between the ADL subscale and the Pain-PC (Spearman's r = 0.75, 95% CI from 0.65 to 0.83) and the Function-PC (r = 0.87, 95% CI from 0.81 to 0.91) were high. The correlation was moderate between the Sports subscale and the Function-PC (r = 0.64, 95% CI from 0.50 to 0.74) and high between the Sports subscale and the Pain-PC (r = 0.74, 95% CI from 0.64 to 0.82). The LOESS curves between the PCs and the FAAM subscales showed consistent strength associations through the scale of the subscale scores.

Before conducting the factor analysis, patients with missing values were excluded, resulting in 146 patients with complete data. Parallel analysis resulted in 3 factors, which were included into the EFA. Instrument items 1 to 12 and 16 to 18 loaded strongest on factor 1, items 19 to 29 on factor 2, and items 13 to 15 on factor 3. The results of factor analysis are presented in Table 3. According to the results of the factor analysis, the 3-factor model completely explained the total variance of the item scores. The sum of the squared loading values of all 3 factors was over 1, indicating the relevance of these factors. Communalities of the items varied between 0.43 and 0.98, suggesting those items with lower values may contain constructs beyond the factors of the model.

The results suggest a 3-factor model for the Finnish version of the FAAM. Factor 1 included items concerning basic foot functions and ADL, whereas Factor 2 concentrated on actual walking ability. Factor 3 consisted of items concerned with heavy performance and sports.

Table 2
Scaled patient-reported instrument scores (mean 0-100) and standard deviations (SD)

Patient-Reported Outcome Measure	Mean Score (SD)
FAAM ADL	74.4 (19.5)
FAAM sports	55.9 (27.0)
EFAS score	47.5 (21.1)
EFAS sport	38.9 (26.3)
FAOS ADL	79.9 (19.0)
FAOS pain	57.0 (20.1)
FAOS QoL	34.9 (20.8)
FAOS sport	53.8 (28.2)
FAOS symptoms	67.9 (20.7)
LEFS	82.1 (14.6)
MOxFQ pain	42.1 (19.2)
MOxFQ social	42.9 (20.0)
MOxFQ walking	65.7 (19.8)
VAS-FA function	65.7 (19.8)
VAS-FA pain	53.7 (19.7)
VAS-FA other	59.2 (17.9)

Abbreviations: ADL, activities of daily living; QoL, quality of life.
The instruments used included Foot and Ankle Ability Measure (FAAM), European Foot and Ankle Society (EFAS) Score, Foot and Ankle Outcome Score (FAOS), Lower Extremity Function Score (LEFS), Manchester-Oxford Foot Questionnaire (MOxFQ), and Visual Analogue Scale of Foot and Ankle (VAS-FA) (N = 182).

Discussion

The purpose of this study was to examine the relevance of physical function and pain interference in using the FAAM, to confirm any additional psychometric properties and to further validate the FAAM for surgically operated patients with chronic foot conditions. Previous research on the FAAM has conventionally used general PROMs in the validation process. We are unaware of any previous study that has used principal component analysis with Function- and Pain-PCs to investigate the relationship between physical function and pain interference and the FAAM as well as assessing the convergent validity of the FAAM.

High correlation of the ADL subscale with both principal components representing function (Spearman's r = 0.87) and pain (r = 0.75) suggests that the ADL subscale captures the functional and pain outcomes of the foot patients. Nevertheless, none of the 21 items in the ADL subscale examine the pain condition, as questions related to pain were left out during the validation process of the original FAAM (2). Based on our findings, it seems that there may be an underlying

Table 3
The floor and ceiling effects, identified factors, and the correlation coefficients of each factor derived from the FAAM subscale items

Item		Floor and Ceiling Effect		Results of Factor Analysis			
				Identified Factors			Communality
		Min (%)	Max (%)	1	2	3	
ADL							
1	Standing	0	33	0.71	0.24	0.28	0.64
2	Walking on even ground	0	31	0.73	0.16	0.45	0.77
3	Walking on even ground without shoes	2	28	0.66	0.19	0.42	0.65
4	Walking up hills	1	25	0.83	0.29	0.25	0.84
5	Walking down hills	1	23	0.84	0.24	0.24	0.82
6	Going up stairs	1	30	0.81	0.31	0.27	0.82
7	Going down stairs	1	28	0.83	0.26	0.21	0.81
8	Walking on uneven ground	2	18	0.76	0.28	0.31	0.76
9	Stepping up and down curbs	1	34	0.76	0.32	0.25	0.73
10	Squatting	2	33	0.60	0.31	0.19	0.50
11	Coming up on your toes	9	22	0.61	0.40	0.24	0.59
12	Walking initially	0	40	0.64	0.21	0.45	0.65
13	Walking 5 minutes or less	0	49	0.49	0.10	0.81	0.89
14	Walking approximately 10 minutes	2	42	0.40	0.21	0.88	0.98
15	Walking 15 minutes or more	3	30	0.48	0.29	0.71	0.81
16	Home responsibilities	0	44	0.51	0.40	0.08	0.43
17	Activities of daily living	0	39	0.56	0.40	0.11	0.49
18	Personal care	0	56	0.56	0.38	0.13	0.47
19	Light to moderate work	0	22	0.50	0.56	0.03	0.57
20	Heavy work	6	13	0.49	0.68	0.03	0.70
21	Recreational activities	10	6	0.27	0.53	0.27	0.43
Sports							
22	Running	4	20	0.18	0.68	0.13	0.51
23	Jumping	8	19	0.14	0.80	0.13	0.68
24	Landing	9	21	0.14	0.84	0.08	0.73
25	Starting and stopping quickly	15	11	0.35	0.79	0.13	0.76
26	Cutting/lateral movements	13	10	0.33	0.77	0.09	0.71
27	Low impact activities	12	11	0.22	0.73	0.15	0.61
28	Ability to perform activity with your normal technique	6	19	0.26	0.70	0.13	0.58
29	Ability to participate in your desired sport for as long as you would like	5	19	0.19	0.64	0.13	0.47
Eigenvalue				15.70	3.28	1.57	
Sum of squared loadings				9.05	7.03	3.32	
Proportion of variance explained				47%	36%	17%	

To facilitate the interpretation of the results, items in the activities of daily living (ADL) and sports subscales are organized according to the factor loading values.

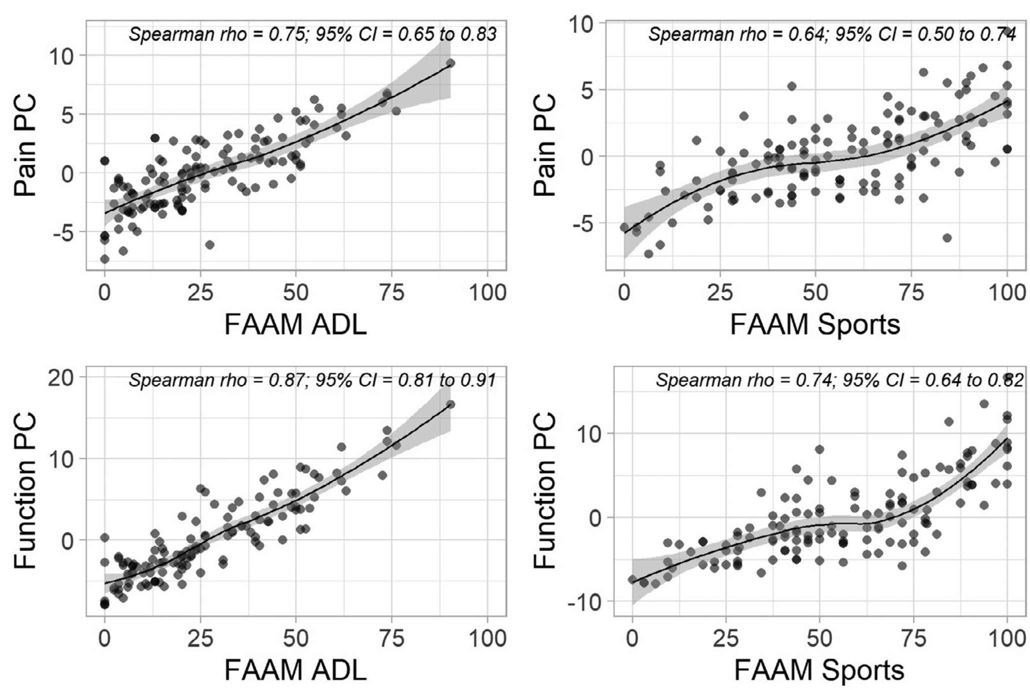

Fig. 2. Correlation between the FAAM activities of daily living (ADL) and sports subscale scores and the function and pain principal components (PCs) derived from the reference instruments and presented in locally estimated scatterplot smoothing (LOESS) curves.

relationship between pain-related disability and the FAAM. This finding is in line with previous research, as the Patient-Reported Outcome Measurement Information System function and pain measures correlated with FAAM ADL scores, highlighting the inter-relationship of pain and function when assessing outcomes in patients with hallux valgus (41). The Sports subscale had moderate correlation (r = 0.64) with the Function-PC and high correlation (r = 0.74) with the Pain-PC.

These findings suggest that pain has a prominent influence on both daily living related- and sport-related outcomes. Furthermore, as patients with severe pain may not participate in recreational activities, they may report inaccurate function-related outcomes. The validity of the original FAAM and the various translated versions has been investigated by determining its relationship with other self-reported outcome instruments. The original validation research on the FAAM along with the French (7), Japanese (8), and Persian (10) translations have found a good correlation between the FAAM subscales and the physical component of the SF-36 questionnaire.

The FAAM and its subscales demonstrated good internal consistency. The results were similar to those reported by previous validation studies of the FAAM, such as Spanish (ADL and Sport: 0.95) (11), Turkish (ADL: 0.95, Sports: 0.91) (6), German (ADL and Sports: 0.97) (5), and Persian (ADL: 0.97, Sports: 0.94) (10). Conversely, high (> 0.90) alpha values may suggest redundancy among the test items, as the items may be too similar (15). There were no floor or ceiling effects, which indicates a proper coverage of chronic foot conditions in the Finnish version of the FAAM.

Within the Sports subscale structure, the results supported unidimensionality as factor 2 loaded on items concentrating on heavy performance and sports (items 22-29). On the other hand, the ADL items 19 to 21 also loaded on factors concentrating on heavy performance, suggesting that these factors could also be suitable for the Sports subscale. Within the ADL subscale, 3 factors were identified. Therefore, the assumption of the 2-subscale structure was dismissed, and a 3-factor model was suggested. Those factors detected in the factor analysis were referred to using the following dimensions: (1) ADL (with the items number 1-12 and 16-18), (2) heavy performance and sports (items number 19-29), and (3) actual walking ability (items number 13-15). The number of identified factors is not, however, consistent with the original, Dutch, French, Japanese, or Persian versions, that identified only 1 factor for the ADL subscale (2,5,7,8,10).

There were some limitations in the present study that need to be recognized. Our results differ from the original FAAM, which identified only 1 factor for the ADL subscale. In the Finnish version, the ADL subscale seems to measure latent traits, which needs to be considered when using the instrument. Although a large and heterogeneous study population is excellent when considering analyses and generalizability, it can cause some problems. The skewed distribution of subscale scores in the ADL subscale could have influenced the EFA, which could therefore have resulted in the Finnish version having different factor structure compared with the original FAAM. Previously, the Spanish version of the FAAM identified a 3-factor structure with a heterogeneous patient population (11). Further, we were unable to retrieve enough follow-up questionnaires from the patients, and thus we were unable to obtain the test-retest responsiveness for the FAAM in this sample. In addition, the dimensionality findings should be checked in a more selected patient population, and the test-retest responsiveness should also be checked. Despite the limitations, the findings of our study have confirmed and extended the previous knowledge of the psychometric properties of the FAAM. We used properly validated and widely used foot and ankle specific PROMs, and the COSMIN checklist for psychometric studies was used in the planning of the study analyses. The data were collected from several large orthopedic centers which reduced patient selection bias.

In conclusion, our results highlight the interplay between pain interference and physical function in chronic orthopedic foot conditions. Based on the heterogeneity of the study population, this relationship seems to be only slightly influenced by demographic factors. Although we were also able to expand the existing body of knowledge of the psychometrical properties of the FAAM, further studies on longitudinal validity are still, however, needed with this version of the FAAM.

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